Vol.XII No.2 February 1983 Second class postage paid at Dallas, Texas

Postal Identification

Publisher, Jim Cranshaw Monthly except July and August

Statement, page 2

Price $8.50 yearly Single issue $1.00

THE HORN SPEAKER

How Phonograph Records ~~are~~ WERE Made

By ALEXANDER H. KOLBE

Record Pressing Room. Master Die Shown in the Foreground. Note Hot Stones on Tables.

Close-up View of Master Recording Machine, Which Records the Voice on Wax.

Close-up View of Electro-Plating Tank in Which Matrix of Record is Made.

Machine Used in Mixing Compound for Making Records. The Rollers Used in the Machine are Always Heated When Working. Machine at Left is Used for Pressing the Compound Into Sheets.

"Recording Room." Note Position of Artists and Director before Horn Which Leads Thru Partition into the Laboratory, Where the Wax Record Machine is Located.

PHONOGRAPH record making is an art, and it is with great care, difficulty and expense that they are produced by the American manufacturers. Thru the kind and able assistance of Mr. A. C. P. Russen, Newark, N. J., engineer and expert on machinery for making not only phonograph records, but music rolls, this article together with the accompanying illustrations was made possible.

Manufacturers of phonograph records absolutely refuse to disclose their secret of making such discs. For this reason alone, photographs have never before been published in this country in connection with an article such as this. The many excuses given out are that every maker of phonograph records, design their own machinery, lay out their own electrical apparatus and often use special mechanical and automatic machines of their own invention.

Talking to the "First" Record

The first step in the manufacture of a phonograph record is the making of original wax discs which are about one-half inch larger in diameter than the finished record to be produced and about three-quarters of an inch thick. These discs are formed by using a fairly soft composition of wax. The original wax discs are placed on the recording machine, which to all purposes is a phonograph except that it is more delicate in construction and that the action of the needle is reversed, that is, instead of the needle falling into a groove, it is forced by the transmitting diafram into the soft wax.

Let us now consider the making of this first impression. The recording room is so arranged that the best results will be obtained. The recording machine is placed in a separate room and only the receiving horns project into the recording room. Special attention is given to the seating arrangements in the recording room. Seats for the orchestra are arranged in a semi-circle. Each chair differs in height to suit the needs of the individual instruments to be played in order that the air vibrations will be most effective in registering thru the diafram on the recorder. In making vocal selections, special attention is given to the distance separating the singer and the machine.

How a Matrix Is Made

The most important factor in the making of records is the first soft wax record or master. The impressions on the wax are very delicate and therefore the record could not be used directly in producing other records. The next step in the manufacture of records is carried out in what we shall term the electrolytic department. The equipment in this department consists of large rectangular tubs lined with lead and filled with a solution the same as used for electrotyping. Suspended on two round brass rods running across these tubs are anodes, usually copper plates, with two wires hooked over the rods, making it possible for the entire plate to be submerged in the solution. Parallel with these bars and midway between is another round bar of the same size on which swivel-connections, evenly distanced apart, are located. Suspended vertically from each of these swivels is a small rod with a long end hanging into the solution below the swivel, and a short end above the solution and the swivel. At the ends of these rods in the solution are the wax discs. See diagram herewith.

The object of the above arrangement is to have the discs maintain a continuous pendulum motion in the solution. This motion is produced by a rod which continuously moves back and forth.

To explain how the small particles of copper are taken from copper plates or anodes and deposited on the wax discs would involve a scientific discussion of great length. It is sufficient to know that the action is due to the electric current plus the chemical action of the solution. The electric current, circulating thru the anode bar and anodes over and across to the wax discs hanging on the swivel arm, carries small particles of copper and deposits them on the wax discs with such close adhesion that they pile up in a mass over the face and grooves of the wax record.

Great care is exercised in keeping up an even, continuous flow of electric current. After an immersion of twenty-four hours the wax record is covered with a coating or sheet of copper. The copper sheet is stript off very carefully and the rough edges of the copper discs are trimmed off that portion which projects outside and beyond the diameter of the wax discs. This disc becomes the master matrix and from it reverse duplicates are produced. The copper impressions stand out on the master matrix where they are deprest in the wax record.

Making a Matrix from a Matrix

After coating the back and edges of the master matrix with wax so that the copper particles will cling only to the part not waxed, these impressions are suspended in the same manner as the original wax disc. After twenty-four hours the discs are stripped again, the same operations being carried out. The second copper disc is called the mother matrix, and by treating the mother matrix the same as the master matrix there is produced what is termed the pressing matrix. The latter is used to press records for the trade. The master matrix is carefully guarded by the producing concern. These steps are all shown in the accompanying diagram.

The product, after passing thru these stages of manufacture is ready for the pressroom. In this department there is a steam rolling mill consisting of two or three steam-heated rollers supported in proper frames and driven by gearing. On the top of this machine there is a hopper into which the composition entering into the finished product is placed. The materials used in the ordinary black record consist chiefly of shellac with portions of rotten stone and lampblack. These are carefully pulverized and screened free from metal or other foreign matter. The composition is placed in the hopper and heated and mixed by the rolls to a consistency a little stiffer than bread dough.

Great care is exercised to get a resultant mixture that will produce a hard, glossy record impervious to slight changes of temperature. A mixture too soft would tend to warp records.

The mixture is flattened out into strips by another set of heated rolls. Rectangular strips about five inches wide and 3-16 of an inch thick are cut and sent to the pressroom. These strips are placed between dies consisting of two square steel plates into the faces of which round depressions have been turned equal in depth to one-half of the thickness of the finished record plus the thickness of the copper matrix. A separate lipt ring holds the matrix by its outer edge face up, so that when this ring is screwed down the matrix becomes a part of the one-half mold.

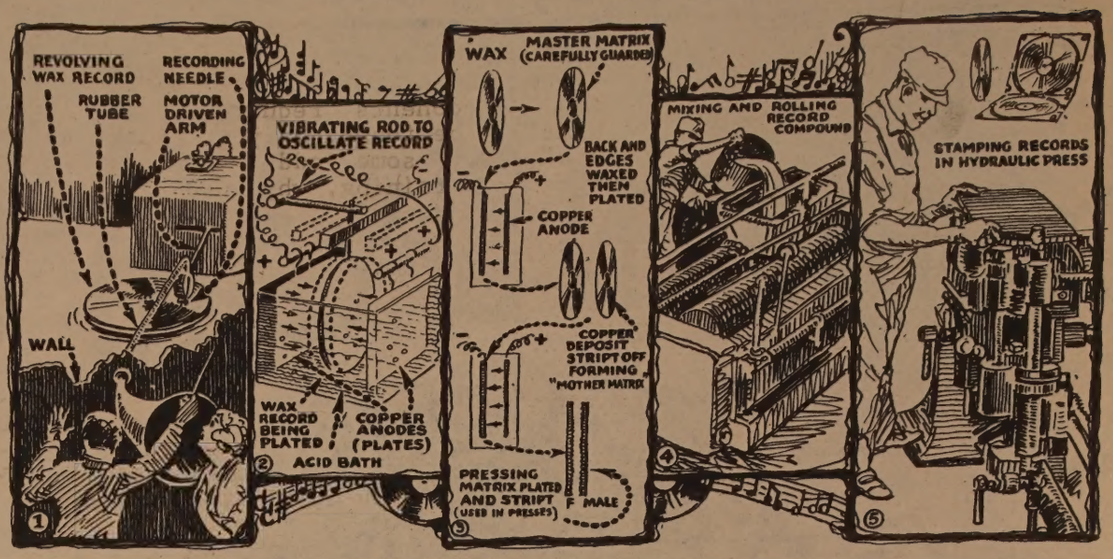
Records Are Stamped in Presses

The composition squares of shellac stock are cut into smaller squares. These pieces are laid on a warming plate until warm enough to proceed. Then the printed paper circle is placed over the central pin face down, and later face up, in the die against the matrix. A hole is then punched into the soft composition. Both halves are placed together and kept in position by the central pin and two dowels.

The complete die is placed in the hydraulic press, the dies being warm and the stock pliable. As the two half-dies are prest together, the lump of stock is flattened until it flows to fill the entire opening plus a little that overflows, the latter forming a slight fin around the outside edge of the record midway of its thickness.

The tables of the hydraulic presses are raised by water pressure coming from a small pump producing 500 pounds pressure to the square inch. Each record is therefore subjected to from 40,000 to 50,000 pounds total pressure.

The finished record is placed in a trimming lathe and the fin or overflow is shaped off. After this process the record is tested on an ordinary phonograph. After testing and labeling the records are ready for the trade.



The Pictures Above, Viewed from Left to Right, Illustrate the Successive Steps Followed in Making Phonograph Records. The Original Wax Record on Which the Music is First Recorded, is Placed in an Electro-Plating Bath; Fig. 3 Shows How the Copper Deposit is Stript Off, and This in Turn Placed in an Electro-Plating Bath, the Second Matrix Being Stript Off and Used as the Stamping Die in Producing the Records, as Shown at Fig. 5.

Science and Invention for December, 1921

AVAILABLE NOW

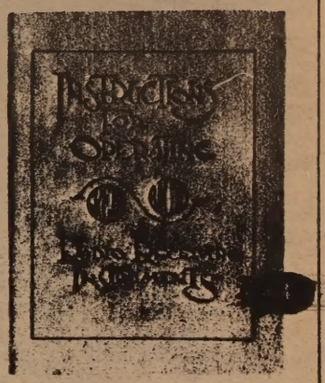
Radio Age is reprinting the Grebe Synchrophase Manual in original brown inks and on high quality paper (not a photocopy). This manual is loaded with history of the company and is documented with many photos, 71 pages. Definitely will enhance your collection. $11.25 ppd.

ALSO AVAILABLE

Grebe Instructions for operating with charts, graphs, block diagrams and schematics of CR-3, CR-5, CR-8, CR-9, RORK, RORD and RORN. Printed in beige cover with deep brown ink, 62 pages. Companion sales brochure showing inside and outside photos of all models above. On high quality gloss stock, 12 pages. $5.50 ppd. for both.

Gerald Tyne's Saga of the Vacuum Tube in hardcover, $11.20 ppd. and softcover, $8.20 ppd. (limited quantity available).

Make check payable to Radio Age, 636 Cambridge Road, Augusta, GA 30909.



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POSTAL IDENTIFICATION STATEMENT The Horn Speaker (USPS 956120) is published monthly, except July and August by Jim Cranshaw, 9820 Silver Meadow Drive, Dallas, Texas 75217. Subscription rates are $8.50 per year, $15.00 for two years. Second class postage paid at Dallas, Texas. POSTMASTER: SEND ADDRESS CHANGES TO, THE HORN SPEAKER, P. O. BOX 53012, DALLAS, TX 75253-0012.

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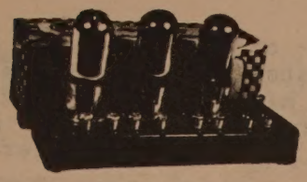

ALLEN BRADLEY
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Amplification *without* Distortion

First there was a concern for reception any kind of reception, legible or not. as the art advanced, a preoccupation with tone became the vogue, during which time massive electro- dynamic speakers vied with flimsy permanent magnet type, creating another of the synthetic controversies so much admired by our earlier media writers.

One of the longest running editorial controversies turned on the virtues of the four types of audio amplification circuitry-- i.e., ordinary transformer coupled, impedance coupled, push pull and resistance coupled. This controversy raged from Zeh Bouck and Henney (who, incidentally, was a very articulated publisher) to Lynch and Priesley in the early 30s.. They resolved nothing, of course, and such sophomoricism died a natural death under the avalanche of rapid new discoveries and advances in early radio knowledge, but they did make for readers being confronted with the necessity of thinking, of crystallizing their own thoughts, of taking a stand.

I have constructed and experimented with about 50 of the early AF amplifier circuits and found that Henney was correct when he editorialized that the impedance type was the most inferior. Harris was correct when he wrote that the ordinary transformer type was the easiest and the cheapest to produce and that mnufaturers would push that type.

While some of the claims advertised by Daven, Alden (Na-Ald), Thor, et al., were puffered as is still the fashion, it can be easily demonstrated that the resistance coupled audio amplifiers could produce the purest tones; and with the proper tubes, could produce sound to fill a hall. They were clean in design, practically foolproof and worked with any circuit reflex, regenerative, TRF and superhet.

The accompanying free hand sketches offer a handful of the better RC circuits. The parts and components required can usually be found in your "junk box", so, some odd Thursday when it's raining, why not have a go at constructing and playing around with one or two?

Simply stated, RC audio amplificatio is an early system for intensifying current variations through the magnifying action of the various tubes of the day. The signal from one tube is passed onto the next tube through the functioning of a high resisance included in the plate of the preceding tube.

With an incoming signal the plate current of the first tube necessarily varies in amplitude, which causes changes across the potential existing on the terminals of the following resistor. This varying potential is applied to the grid of the next tube through a coupling condenser (also called an isolating condenser in the early days). This condenser isolates the grid from the high positive potential applied to the first tube. The fourth resistor is a conventional grid leak, preventing choking by an accumulation of excessive change in the grid.

One of the virtues of the RC amplifier is that once you have decided on the circuit you prefer, the value of the components remain constant. this is not true of the other three types, especially push pull.

The ordinary transformer coupled and impedance coupled audio amplifiers may be considered allied, in that the latter has two windings, in which the coefficient of the coupling and the turns ratio are nearly unity. The later models of Alden's "Truphonic" amplifier would be a good example here. The impedance acts as an auto transformer, the same winding acting as primary and part secondary at the same time.

In the ordinary transformer coupled amplifier, the maximum amplification per stage is equal to the amplification constant of the tube, multiplied by the turns ratio of the transformer. The voltage of the secondary bears the same ratio to the input or primary voltage as the number of turns in the secondary bears to the turns of the primary. In other words: $v1/v2=n1/n2$ where: v1 and v2 = primary and secondary voltage; n1 and n2 = primary and secondary turns.

This step up voltage occurs only under certain theoretical conditions, which are never attained in actual practice. However, the maximum voltage attainable in a transformer coupled amplifier is: $K=u(n2/n1)$ where: K = total voltage amplification and u = voltage amplifying constant of tube.

All early transformers were noted for their distortion, simply because they could not produce the same amplification at all frequencies. This led to further experiments which produced the other three types of audio amplifier circuitry, with the RC becoming the most popular for nearly a decade. The relationship between input and output of the RC circuitry is practically linear. What distortion may occur is due to stresses imposed by unfavorable tube characteristics. While the amplification per stage is not so great as that of a transformer coupled type, results per dollar was and is the ultimate standard of efficiency. Nevertheless, the resistance coupled audio amplifier ranks first.

The early push pull amplifiers actually increased output very little more than ordinary transformer coupled circuits, but the PP circuitry was capable of killing distortion, using a higher plate voltage without overloading the tubes and, of course, using matched tubes. The use of C bias was mandatory.

Three stages of RC amplification are quite sufficient for most purposes, giving amplification generally greater than a 2 stage transformer coupled amplifier. Two stages inputted from an efficient reflex tuner will operate a speaker easily. More than three stages is not recommended with reflex and superhet sets. Four stages have been proven to be the practical limit and a switching arrangement for cutting out the last tube should always be provided, as it only required for very weak signals, or if you wish to fill a hall. Further, if you do use a fourth stage, don't use the 01A, instead, use 16A, 12A or 71A. When using the 16A, a coupling resistor of 100K is suggested.

RC amplifiers can be added to a transformer coupled stage, using only the first AF trans-

former and shunting the second. Using both transformers will result in distortion. Also, when utilizing a stage of transformer coupled AF, two stages of RC need only be used.

As for RF amplification, the RC circuitry is not very efficient on 200 to 550 meters. This is because the coupling resistor is virtually shunted by the plate to filament capacity of the preceding tube. In effect, a by-pass about the resistor through which RF current detours. RC amplification, however, is effective on waves above 2,000 meters, which makes it quite satisfactory as an IF amplifier in superhet circuits of the early days.

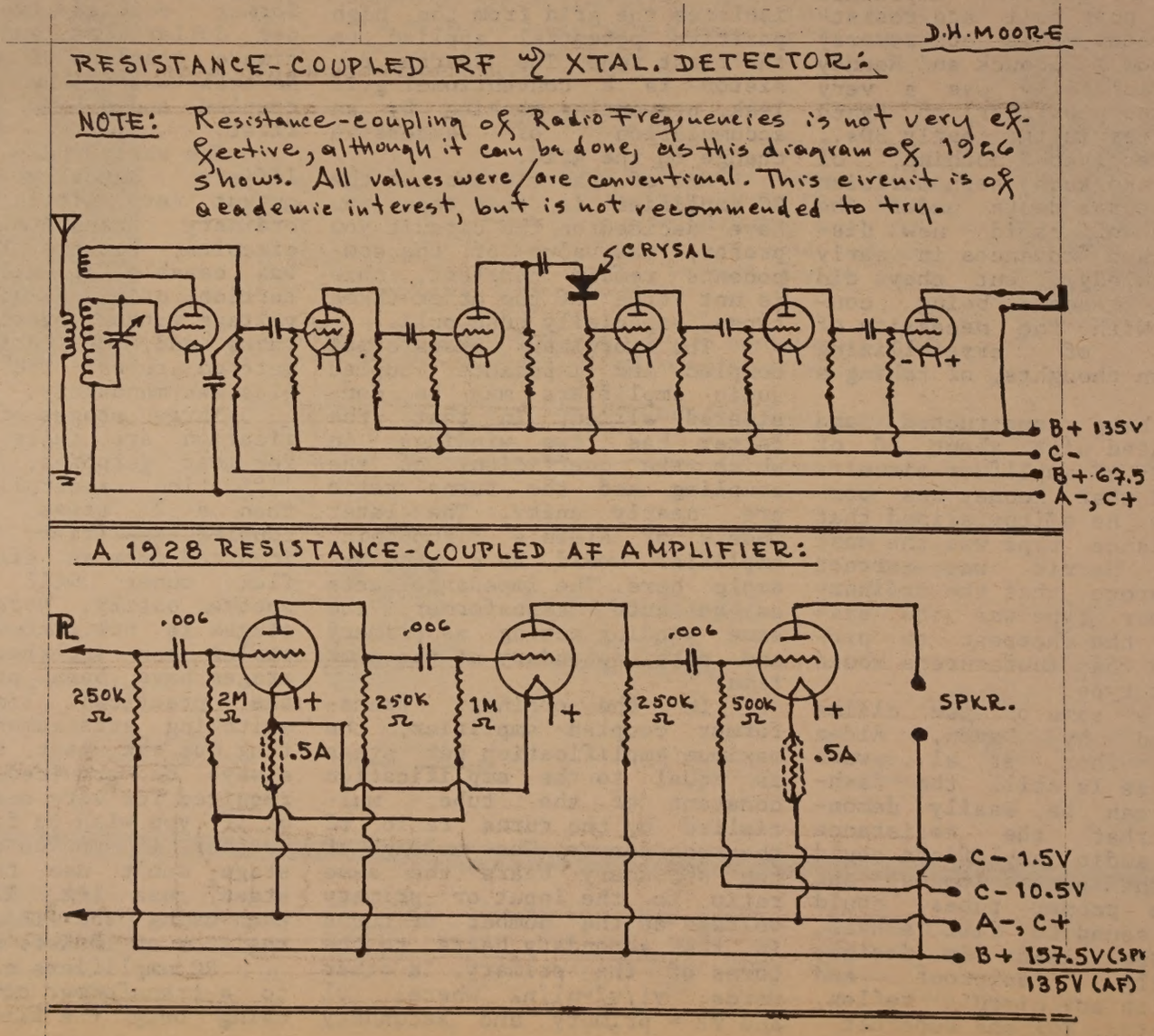
Variable resistances are not necessary, although you will find one RC circuit amid the accompanying sketches utilizing such. The values are all uncritical, as you will note. Any value between 50K and 150K gives almost unchanged amplification; 100K is usually the most efficient. When inputting from a reflex or transformer coupled stage, 50K is recommended for the first RC stage.

While the 01A was generally used, other tubes will perform quite satisfactorily, and include such tubes as 99, "N", WD-12, D2, D3 and Meyers--the latterr being an excellent tube for RC circuits, but there doesn't seem to be too many available these days.

Because plate inductances and their accompanying feed back are eliminated, the RC circuit is probably the most stable of all amplifying circuits or arrangements. But it should be stressed that only absolutely GOOD tubes should be used in all stages. Weak or "orphan" brand tubes are a wastage, and will almost always result in acoustic howl. Howling has been known to occur in three and four stage RC circuits when the last tube can be cut in or out via switch. When this occurs, the last coupling resistor should be increased to the highest value giving best reults. Grid leaks can also be fine tuned for greater stability.

RC amplification functions with the effects of a negative bias being applied to audio frequencies - i.e., the varying positive charge on the coupling side of the isolating condenser induces similar negative fluctuations on the grid side. This causes the plate current to "modulate down", to decrease when the amplifier is working. Thus, no extra bias is necessary.

Plate voltages of at least 100V should always be used. One may go up to twice the maximum potential recommended by the tube manufacturer, as the actual applied voltage is greatly reduced by the coupling resistance which is in series with the plate supply. I have impressed 140V on the plates of 01As with excellent results.

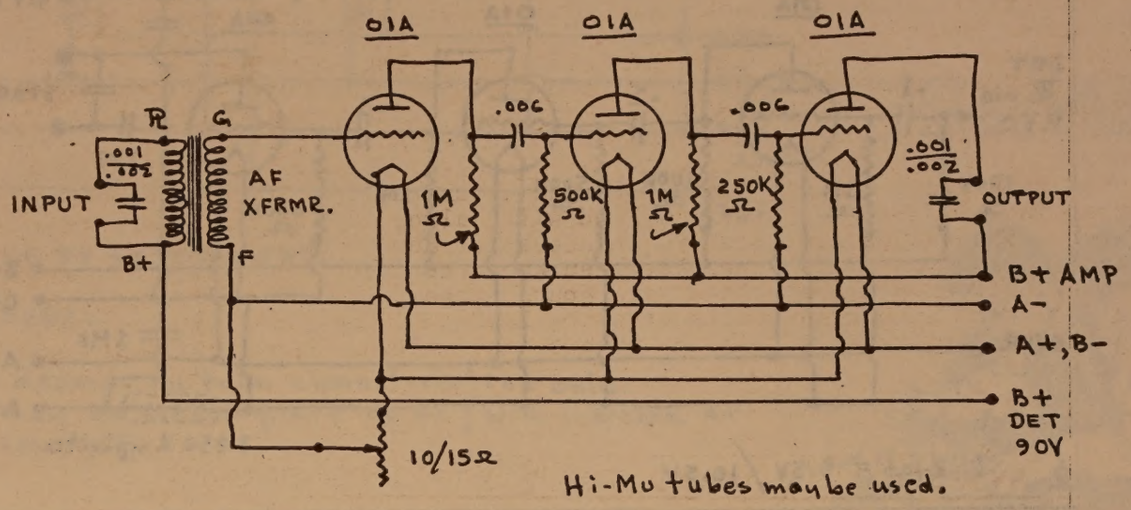


When inputting from a DFT tube plate voltage of the detector should be doubled or tripled. Detector plate potential should be increased until the tube detects most efficiently, or. as in the case of regenerative receivers, until the set regenerates or oscillates in a normal manner. Because of the increase in plate voltage, phone jacks should never be inserted into the detector circuit. It is good practice to insert a resistance of from 5K to 50K in series with the speaker leads, to lower plate current, due to the comparatively low resistance of early phones and speakers.

Any resistance coupled amplifier circuit is coupled to any type or make of receiver in exactly the same way, regardless of any diversity of circuitry. Here, then, is a pro-

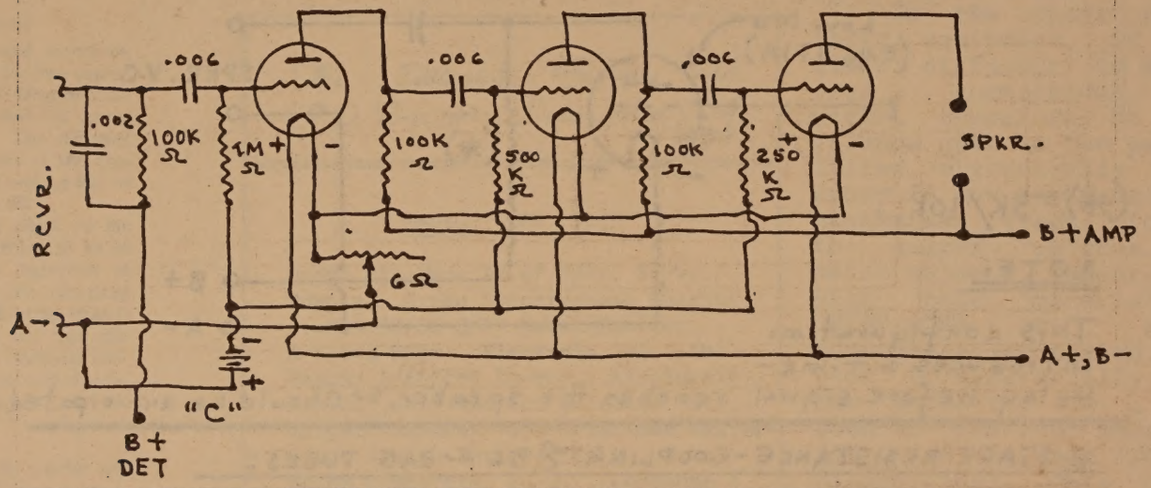
D.H.MOORE

DAVEN R-C CIRCUIT; 1927:

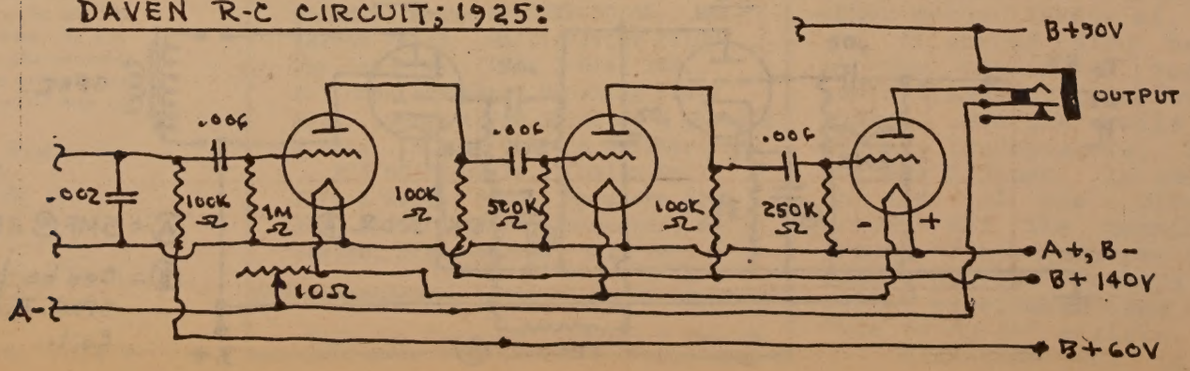


Hi-Mu tubes maybe used.

3-STAGE R-C CIRCUIT:



DAVEN R-C CIRCUIT; 1925:



ject, I believe, is interesting to experience how it was done.

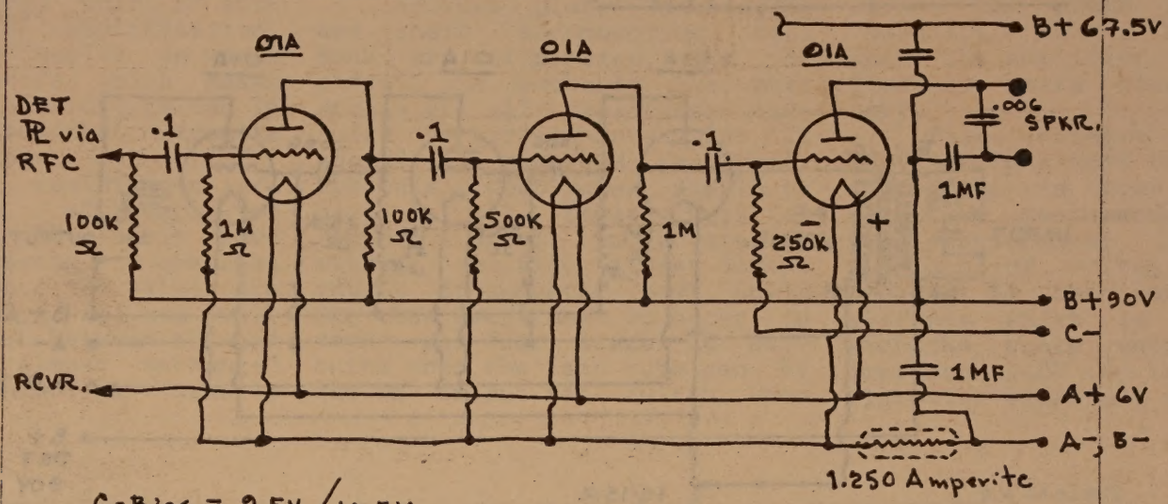
NOTE: This article selected from a work in progress: VINTAGE RADIO NOTEBOOKS of D. H. Moore, who has been very kind to share his experiences with us.

References: (While there are numerous references to RC amplifiers scattered through early radio media, I find that the following are probably the most authoritative. - dhm)

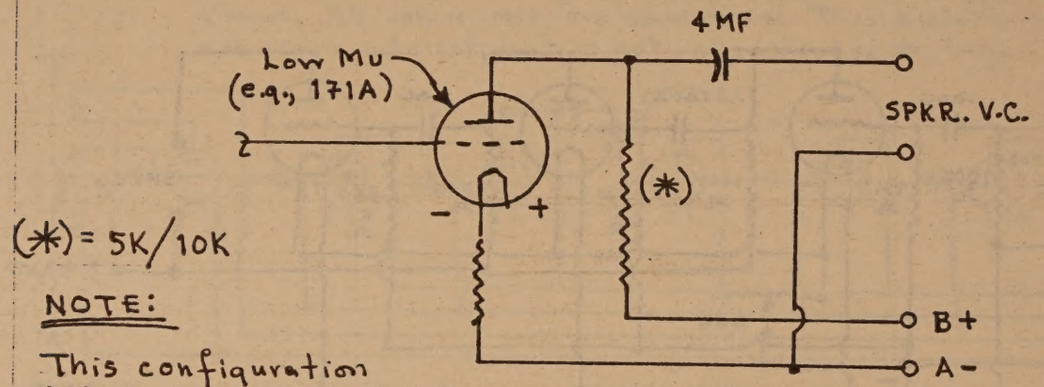
CITIZEN'S CALL BOOK, March, 1929
AMATEURS' HANDBOOK, Vol. 2, 1926
RADIO WORLD, May/October, 1927; December, 1930

D.H. MOORE

DAVEN R-C CUIRCUIT; 1926:



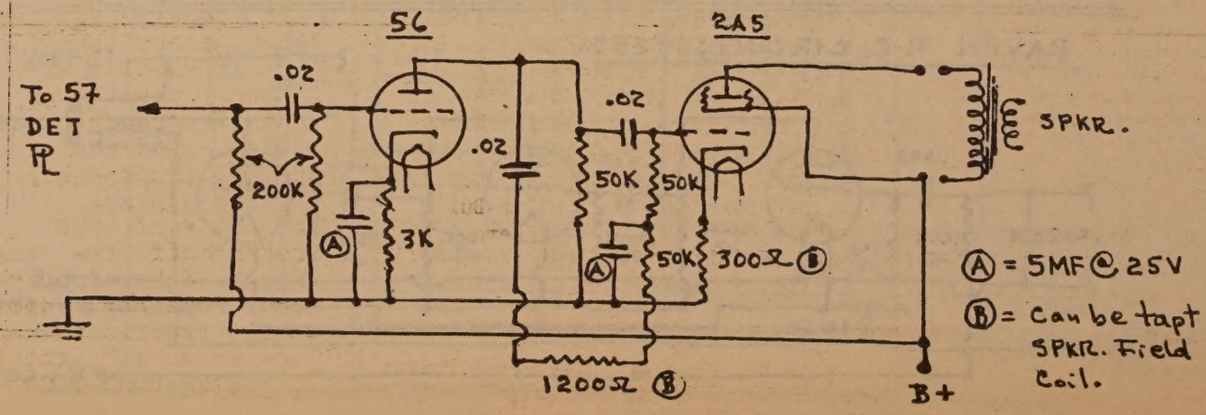
RESISTANCE COUPLING TO CONE SPEAKER:



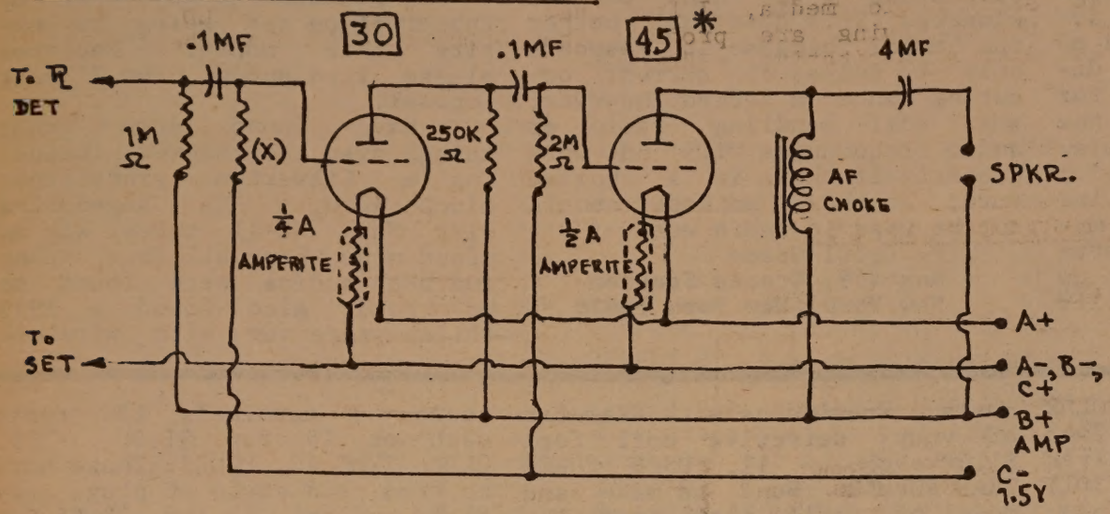
NOTE:

This configuration introduces a time-delay before signal reaches the speaker, & should be anticipated.

2-STAGE RESISTANCE-COUPLING w/ 56 & 2A5 TUBES:



A 2-STAGE R-C AMPLIFIER:



(X) = BEST VALUE BY EXPERIMENT.

B+ = 135/180VDC.

Voltage gain depends on tube characteristics only.
*=The 40 tube may be used in place of 45; will increase AF gain, 180V (max.) TP.

Atwater-Kent 40 and 42

"We have had several of these sets in the shop afflicted with an apparently incurable howl, while heating up. Changing tubes and testing condensers gave no hint of the trouble. On checking the audio wiring we found that the secondary of the audio transformer was connected backwards—that is, the blue wire, or F, to the grid and the black wire, or G, to the grid return. We have run into the same trouble when the primaries have been reversed."—Charles E. Anderson, Claysville, Pa.

RADIO NEWS FOR MAY, 1932

Service

T. R. F. Receiver Sensitivity

A loss in selectivity and sensitivity often occurs in many of the less expensive models of tuned-radio-frequency receivers after they have been in operation for a year or so. The difficulty usually occurs in receivers of the type employing two 24's, a 47 and an 80; or a 57, 58, 47 and an 80 or 82.

A current and voltage check on the tubes will indicate everything to be in good shape, but a close inspection of the set will reveal that the two-gang condenser unit is attached to the chassis by two machine screws and that this fastening forms the only electrical contact between the condensers and chassis. Rotor plate wipers, if present, do not have ground leads to the frame in most cases.

This is the source of the trouble and may be remedied by soldering a heavy wire between the condenser frame and the chassis, and realigning the set. The low-resistance path between the condenser assembly and the chassis makes it possible to peak the set critically and thus permits it to be operated near the oscillation point again.

WILLIAM A. BURGMANN.
1920 *Bacon St.*,
San Diego, Calif.

• SERVICE FOR APRIL, 1934 •

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RADIOS FOR SALE

Scott All-Wave XV w/ Spkr. & Pwr. Supply...Grebe Synchrophase Chassis ...A-K 33/55-C/37 Metal Cabinet... A-K E-3 Spkr...Electrola 760...Am. Bosche 5/66/260 Lo-Boy...All-Americ. Mohawk...All-Americ. Chieftan Five.. Sargent-Rayment 710...Freshman Masterpiece V with Integral Spkr...Echophone Commercial EC-2...Echophone 4.. Gilfillan 40...Philco 45-150/19/112.. Freed-Eisemann NR-5/NR-80/48...Patterson PR-10...Hallicrafter SX100... Day-Fan Five...Fada 3-Dial TRF... B-T Counterphase...Browning-Drake 1926...Sargent Pre-Selector & Chassis & Spkr...RCA 17 Console & Table-Top ...RCA 60/80/22/28...Custom-Built TRFs & Regen. Sets...Speakers From RCA, Baldwin, Rola, Sonocorde, Nat'l., Zenith. Stew.-Warner, A-K, etc.

SASE For Complete Listings & Prices.

by F. Cecil Grace

In the repair of antique radio equipment, it is sometimes difficult to make soldered connections. Readers might, therefore, be interested to know that a two part. silver filled. electrically conductive epoxy is now being made for the watchmaker trade, for repairs to quartz watches. Any two metal objects cemented together with this material, called "WIRE-BOND .001", are electronically connected. I have used it successfully to put a new phone tip on a headphone cord of the type made of metal foil and cordage (for extreme flexibility). This is a difficult repair to make by any other method I know of.

It should also be useful in the repair of radio and audio frequency transformer and chokes, and the coils of earphones, loudspeakers, and phonograph pickups, in cases where an end of the winding has broken off the terminal, although I have not yet tried any such repairs. Perhaps someone will experiment and write a "how to do it" article.

WIRE-BOND .001 is made by

Zantech Incorporated and is sold by mail by Marshall Swartchild Company, 109 North P. O. Box 726, Chicago, Illinois 60690 for $19.95, plus shipping. For this you get one syringe of epoxy part A, one of part B, 8 inches of .002" diameter gold wire (useful for extending broken ends of the winding), one mixing spatula, and one ceramic plate on which to do the mixing, and instructions for use of the material in the repair of quartz watches. When you've used up the epoxy, you can get refills for $14.95.

The instructions describes some repair methods for the motor coils of quartz analogue watches that result in short circuiting a few turns of the windings. This does not bother the motor because it responds only to pulses of current occuring once a second. However, any coil handling radio or audio frequencies will not work properly if there is a shorted turn, so these methods should not be used in radio work.

F. Cecil Grace
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Mailbox

Hello JIm

I realized to day that my subscription was going to expire this month. Enclosed please find enough for 2 year renewal.

Have found some great things over the summer including a Silvertone grandfather clock-radio, RCA Regenoflex with fair WD-11 tubes. Was on cloud nine when all four tubes and both audios were found to be good. Also found a 1939 Philco receiver with wireless

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WINTER SEASON 1983 --- OLDE TYME RADIO COMPANY ---- 2445 Lyttonsville Road, Silver Spring, MD 20910. (301) 585-8776. -- After 7:00 p.m. local time. No. 183 - 1. HEADPHONES .GENERAL SERVICE --- $3.00 PAIR . VINTAGE pair $6.50. - 2. OLD STYLE REPLACEMENT SPEAKERS both ed and pm. Sizes vary from 2" ovals to 10" rounds. Send us your needs for quote. - 3. ELECTROLYTIC CAPACITORS . 60 UF at 250V 50 cents ea or 3 / $1.00 . Many types -send us your needs and we will send quote . 40 uf (small size axial leads) 220V $1.00 ea or 3 / $2.75 . Screw base (large) 40 x 40 uf at 450V $3.00 each . cap. bonanza 20pf to 0.1 uf 25 / $1.00 - 4. WIRE DEPT. . 6 COND. AK style battery cable $1.25 / ft. . 5 cond. AK style battery cable $1.00 ft. . Brown silk type power cord .30 / Ft. . #20 magnet wire double cotton wrap 80 ft. roll $3.50 . Single conductor green cloth covered wire- for olde tyme radio coils .20 / ft. . Single conductor black cloth covered olde tyme radio hookup wire 12 cents / ft. . Single conductor # 18 bare copper wire (stranded) .25 / ft. - 5 VOLUME CONTROLS 1/4" SHAFT 10 ohm to 1.0 meg. $1.25 ea or 3 / $3.00 - 6 Escutcheon screws- guage length respectively 0-1/4", 0-3/8", 1-1/4", 1-3/8", 2-1/4*", 2-3/8" 10 for 50 cents. BRASS, FLAT 'OR ROUND HEADS *round head only - - 7. Exact replacement Radiola II or VIII leather handle. only $4.50. - 8. OLDE TYME RADIO TUBES tubes from the 20's thru the 60's used / tested or new. Write for quote. - 9 COILS ANT, RF, OSC and IF manufactured by Meissner, Caron, Miller, etc. $3.50 ea. Special or multiple band coils higher- write. -10. Slip over coils for ant. and RF coils. Provide us with diameter of your defective coil form $1.50 each. - 11. USED POWER TRANSFORMERS Send us make and model of radio. Also need size of old transformer. We will quote. - 12. We cannot provide WD-11's but we can provide WD-11A's made with 864's in WD-11 bases. Work better than WD-11. $15.00 each or 2 for $25.00. - 13. DIAL LAMPS - any type. 25 cent each or 5 for $1.00. - 14. Crystal set items .galena xtals $1.50 each . xtal detector ass'y w/xtal $3.50 each . unmounted xtal detector ass'y without xtal $2.00 each. - 15. Headphone replacement cords (black) . Brandes and Baldwin types $4.35 each . Olde tyme speaker replacement (black $3.50 ea, red $4.00 ea) cords . pin jack 25 cents each or 5/$1.00 -16. Schematics for sets manufactured from 1920 thru 1946 $1.50 for complete data package $2.50. We also have schematics and data for some early TV sets. Complete data package $3.00 to $5.00, depending on number of pages. Write- we will quote. - 17. Olde tyme instrument knobs 25 cents each or 5/$1.00 - 18. Fahnestock clips 15 cents each or 8 for $1.00 - 19. Stancor output transformers primary imp. 2,000 ohms secondary imp. 3.2 ohms. Good for matching triode to speaker. $2.50 each. - 20. Olde tyme phone plug. Will accept headphone tip jacks.$1.85 each - 21. RESISTOR LINE CORD REPLACEMENT KIT . TYPE RLC-1 FOR 4 TUBE SETS WITH (2) 6.3V PLUS (2) 25V TUBES $3.50 EA . TYPE RLC-2 FOR 5 TUBE SETS WITH (3) 6.3V PLUS (2) 25V TUBES $4.50 - 22. Padder capacitors for BC superhets $1.25 each OR 2 for $1.75 - 23. Olde tyme spaghetti assorted sizes and colors. package .....$3.00 -24. Tie down terminals- 3 terminals 10 cents each or 15 for $1.00 - 25. OLDE TYME AC PLUGS. These hard to find old style AC plugs only $1.10 ea ort 2 for $2.95 Get them while they last. - 26. Olde tyme toggle switch with short bat with ball $1.85 each. Good for AK-37, etc. Radiola 17, 18, etc. - 27. SPEAKER GRILL CLOTH, 2 PATTERNS.. $3.25 SQUARE FOOT. SEND FOR SAMPLE. - 28. WHITE TUBE CARTONS- type A size 2x2x6 20cents ea type B 1 1/2 x 1 1/2 x 5 18 cents ea type C 1 1/4 x 1 1/4 x 3 3/4 16 cents ea type D 1x1x3 15 cents ea-- Discounts given when ordering large quanities. - 29. AUDIO TRANSFORMERS We now have a sttock of Stancor A53C audios, but due to high procurement costs we are forced to set the price at $12.00 each. IF YOU DON'T SEE IT, ASK WE HAVE MUCH MORE, BUT CAN NOT LIST EVERYTHING IN THIS FLYER. OUR SHIPPING POLICY --------- We ask that you send sufficient funds to cover shipping and handling costs. Handling charge is levied to cover the cost of jiffy bag, boxes, gasoline (10 miles each way to UPS). Overages if under $1.00 will be credited to future orders or refunded if requested. Overages over $1.00 will be returned with your order when it is shipped. Unless specified otherwise, orders weighing 1 lb. and under will be mailed. Orders over 1 lb. will be shipped by UPS. When making inquiries, please send S.A.S.E. and give invoice numbers when possible. OLDE TYME RADIO GUARANTEE Anything we sell is unconditionally guaranteed. If not satisfied, just return it and your money will be returned to you at once. SERVICING RECEIVERS FOR OVER 30 YEARS PHONE (301) 585-8776 after 7:00 p.m. local time.

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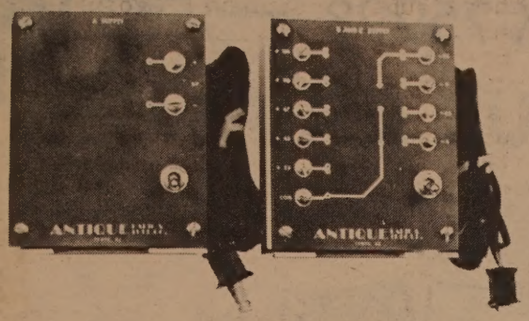

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remote control like new complete with owner's manual. It works very well. Also have a Philco chairside model with remote speaker in a small console cabinet that has a flat cable interconnecting both units.

All in all not too bad for the summer. Hope all is well your way. My best to you for the New Year.

Best regards,
Rick Taylor
7136 E. Lea Road
Chattanooga, TN
37421

Dear Jim,

Enclosed is check for the amount of $8.50 to renew my subscription to THE HORN SPEAKER. Ihave been down here in Florida 2 years now and I did pick up a few more radios, a WESTINGALE ELECTRIC CO. 3 tube set using 99's a W.E. 1922 broadcast mike with the brass case. Also found a Fisher spark medical unit with two quenched spark gaps and last but not least a W.E. 92.A amplifier with all tubes in place and W. E. 555 speaker unit. I am still trying to find out about the LEUTZ SUPER DX EIGHT and SUPER DX SEVEN TYPE L SUPERHETRODYNE RECEIVER, they were made by C. R. LEUTZ INC. about 1922. The DX EIGHT uses 99 type tubes the DX SEVEN uses 201A tubes. Well that's all for now. Maybe, one of your readers can help me.

Thank you,
Julius H. Pilger, K2KCB
104 Conner St. S.W.
Live Oak, FL 32060
(904) 362-6901

Dear Jim;

I need a wiring diagram of a RCA Radiola AR 182 super hetrodyne or Super VIII. The wiring diagram must consist of the internal parts such as transformers, coils and condensers. And of the internal tube circuit which is all sealed in bee's wax.

Thanking you,
Russell F. SChoen
R # 1, Box 35
Clintonville, WI
54929

EDITOR.. One of our subscribers should have a schematic of the unit, which is usually called a "catacomb."

The Editorial Group, Ltd.
P.O. Box 521, Palo Alto, Calif. 94302

RADIOS WANTED

Am. Bosch 260-C...Fada 66(KY)...RCA K-64...Remler "29" Infradyne...Pilot "Dragon" 84...Bremer-Tully 80....De Wald 801...Lincoln R-9 & SW 33..... Most Any Kit Radio From The Late 20s & Early 30s.

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LIKE FACTORY MODIFIED A.K. 20C CABINET TO FIT A.K. 30 CHASSIS; NEEDS BATTERY CABLE AND TUNING BELT, $50 :: AIRLINE 62-147?? (1936- SQUARE- TOP CABINET- GOOD- UNTESTED) AIRPLANE DIAL; NO KNOBS, $30 :: CROSLEY 167 (1934- CATHEDRAL CABINET- VG- NOT WKG) SMALL CABINET SIMILAR TO FOS PG75, $75 :: E. H. SCOTT SLRM (1945- METAL CABINET- VG- WORKS GREAT) MADE FOR NAVY; FANTASTIC FOR DX'ING, $175 :: PHILCO 49-607 (1949- PORTABLE CABINET- EXC- NOT WKG) 'ALLIGATOR SKIN' W/ROLL TOP WOOD FRONT, $15 :: RCA RADIOLA IIIA (1923- RECT BOX CABINET- MINT NOT WKG), $80 :: SILVERTONE 4520 (1937- SQUARE TOP CABINET- MINT- UNTESTED), $40 ::::: SEND LARGE S.A.S.E. FOR COMPLETE AND UP TO DATE LIST.. RON BOUCHER, 376 CILLEY ROAD, MANCHESTER NH 03103, (603) 669-1698

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SALE. NEW, ORIGINAL carton A53-C STANCOR general purpose 1:3 ratio audio interstage x-formers for $14 ea, or 2 for $26 or 4 for $50. Unused Aerovox old style screw base oil filter caps (far better than electrolytics). Size is 4 mf at 600V. Price is $2.75 ea. or 4 for $10. Will sell (10) new Mallory 0.1 mf at 600V tubular MYlar caps for $7.50 (old price was $5.85.. inflation got us.) WANT TO BUY one nice original knob for a Majestic model 70-B radio. Will pay $8 for it. Dr. Zee still provides electrical restoration on anything from Scotts to Silvertones, car radios, or transistor sets. My services are not cheap nor is the craftsmanship, at 23 years experience. Postage extra. Dr. Zee's OLD RADIO HOSPITAL; P. O. Box 31555; Houston, TX 77235; (713) 723-4254 after 6:30 p.m.

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FOR SALE: RADIOS, TUBES, LITERATURE, ETC. SEND L.S.A.S.E. FOR LIST. WANTED: A-K BREADBOARD, A-K LITERATURE OTHER A-K ITEMS. J. L. WILSON, 1475 MOSSLINE DRIVE, JACKSON, MS 39211

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FOR SALE - YOU BID YOUR OWN PRICE Old no name set, 20's vintage; Zenith 6S229; Philco 620; Silvertone 7166; Motorola 5A5; Microvox; BC 611; telegrapher sets, antique electronics board. S.A.S.E. brings description and photos to you. JOHN STRATTAN, 701 WATERSON TRAIL, MIDDLETOWN, KY 40243.

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COMPLETE INSTRUCTIONS and tube test charts for Precision Model 510. M. G. Turpin, 1809 Brunette Avenue, Coquitlam, B. C., Canada, V3K 1H3.

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WANTED: 21 INCH MAHOGANY MUSIC MASTER BELL. CONDITION NOT IMPORTANT. CHARLIE STEWART, 900 GRANDVIEW AVENUE, RENO, NV 89503

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WANTED: SCOTT COIL SHEILD CANS (late copper type). Musicmaster radio in deluxe cabinet; Philco Pup radio. Dick Howe, 9318 Wickford, Houston, TX 77024.

WANTED: SE950, SE143, SE1400 and other SE series sets, type B amp., BC131, BC161, and other BC series, SCR equipment, Leutz, Norden Hauck, any GR parts, VT1, VT2, VT5 tubes. Incomplete sets OK. Also Grebe CR equipment. Ray Garner, Route 1 Box 320, Big Sandy, TN 38221.

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June, July and August
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C&B for Tara RP

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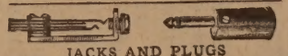

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F133—One spring (open circuit). Each.$0.43
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Pencil mark type. Removable black enameled cap.

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Mounting holes spaced to fit screws of above Grid Leak. Mica insulation, wrapped with varnished cambric tape. Capacity, .00025 Mfd.

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Selected and tested galena or silicon. Each box contains enough for four to six ordinary crystals.

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INDUCTANCE COIL MOUNTINGS

For base or panel mounting. Connecting leads furnished, coil settings are adjustable by means of knobs. Made entirely of bakelite with nickeled brass metal parts. Coil position can be locked by knurled set screws.

F1603—Three coil mounting $3.90
F1602—Two coil mounting 2.75
F1601—Single coil mounting ..... .50

INDUCTANCE COILS

Rigidly wound, nicely finished, low distributed capacity. All coils are equipped with standard mountings. We can supply any of these coils without mounting plugs, for 55c less than the prices shown. The wave lengths shown are range limits, based on a variable condenser of .001 Mfd. capacity.

	Number of Turns	Wave Lengths	Price, Mtd.
F1725	25	125- 250	$0.88
F1726	35	175- 450	0.85
F1727	50	240- 720	1.03
F1728	75	390- 910	1.07
F1729	100	500- 1450	1.12
F1730	150	800- 2000	1.16
F1731	200	900- 2500	1.28
F1732	250	1200- 3500	1.34
F1733	300	1500- 4500	1.35
F1734	400	2000- 5000	1.56
F1735	500	2800- 6100	1.62
F1736	600	4000-10000	1.77
F1737	750	5000-12000	1.92
F1738	1000	7000-15000	2.27
		9750-19500	2.48
		14500-26500	2.64

A WIRE

This variometer is made of high grade black moulded composition. Wound with green silk wire. Metal parts are nickel plated.

F1220—Moulded variometer $4.95

DAYFAN MOULDED VARIOMETER

This is a bank wound variometer.

F1222—Variometer $6.95

AUDIO FREQUENCY AMPLIFING TRANSFORMERS

Correctly designed for minimum distributed capacity and low core loss. Shielded, beautifully finished in nickel and black enamel. Ratio 5½ to 1. Bakelite panel. Two ratios.

F1506—Shielded Transformer $3.75
The unshielded types listed below have terminals mounted on
F1510—Transformer, 10 to 1 ratio.....$3.55
F1503—Transformer, 3 to 1 ratio..... 3.50

THORDARSON AUDIO FREQUENCY AMPLIFYING TRANSFORMER

There is probably no better known transformer. Made by a company that specializes in transformers. Entirely encased in sheet aluminum shield. Heavy connecting straps to binding posts.

F1504—Thordarson Transformers, 3½ to 1..$3.55
F1505—Thordarson Transformer, 6 to 1..$4.10

"B" BATTERIES

Standard high grade radio "B" batteries. Never over five days old.

F230—22½ volt Signal Corps type. Size 3½x2½x 2½ inch $1.06
F235—22½ volt U. S. Navy variable—5 positive taps. Size, 5x3x2½. Price.....$1.80
F240—22½ volt large variable—5 positive taps. Size, 6½x4x3. Price..... 2.25
F245—45 volt large size. Leads only. Size, 13x4x3. Price 4.00

INDUCTANCE SWITCH

For neat appearance and time saving, we suggest this inductance switch, as it needs but one hole in the panel to be mounted. Switch Points are mounted on this switch. 15 switch points, in all.

F1095—Inductance Switch $1.76

STORAGE "A" BATTERY CHARGER

Charge your "A" Battery at home, at a cost of a few cents. Screws into a 110 volt socket to be used with 60 cycle current. Remember our GUARANTEE is your protection.

F62—Storage "A" Battery Charger....$13.65

MAGNET WIRE

High grade, double cotton insulated magnet wire. 8 oz spools.

	Price per spool
F18	$0.48
F20	0.58
F22	0.73
F24	0.83
F26	0.93
F28	1.12
F30	1.63

BINDING POSTS

Complete with screw and washer. All brass finished in polished nickel or with black composition top as listed. Order by number.

	Each	Doz.
F110—Large size, all nickeled	10c	95c
F122—Medium size, nickeled, with hole for phone tip or wire	4c	35c
F112—Medium size, black composition top	5c	45c

**5584 *73*
ART B CORBUS
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